WORKSHEET 1.3 B
Normal Distributions Review

NAME: Key

1. **The life expectancy of a particular brand of light bulb is normally distributed with a mean of 1500 hours and a standard deviation of 75 hours.** $N(1500, 75)$

   a. What is the probability that a light bulb will last less than 1410 hours?

   $P(X < 1410) = 0.115$

   b. What is the probability that a light bulb will last more than 1550 hours?

   $P(X > 1550) = 0.252$

   c. What is the probability that a light bulb will last between 1563 and 1648 hours?

   $P(1563 < X < 1648) = 0.1762$

   d. 15% of the time a light bulb will last more than how many hours?

   $P(X > ?) = 0.15$ $\quad$ invnorm$(0.85, 1500, 75) = 1577.73$ hrs.

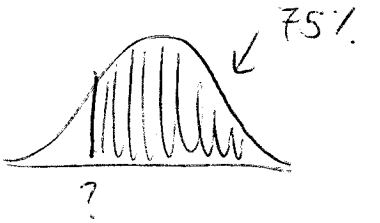
2. **A water fountain is designed to dispense a volume of 12.2 oz. with a standard deviation of 0.5 oz.** $N(12.2, 0.5)$

   a. What percentage of cups end up with at least 12 oz.?

   $P(X > 12) = 0.655$

   b. 75% of the cups contain more than how much water?

   $P(X > ?) = 0.75$ $\quad$ invnorm$(0.25, 12.2, 0.5)$ $= 11.863$ oz



   c. Find the IQR for the amount of water dispensed.

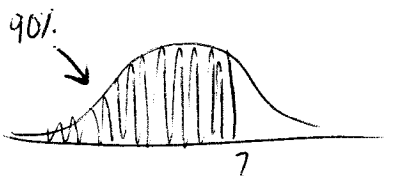
   $(Q_3) = 0.75$ $\quad Q_3 =$ invnorm$(0.75, 12.2, 0.5) = 12.537$ oz

   $(Q_1) = 0.25$ $\quad Q_1 =$ invnorm$(0.25, 12.2, 0.5) = 11.863$ oz

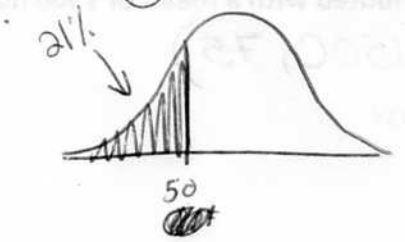
   subtract. $\rightarrow$ 0.674

   d. Find the 90th percentile for the amount of water dispensed.

   $P(x < ?) = 0.90$ $\quad$ 12.841 oz.



3. **Given a normal distribution with a standard deviation of 10, what is the mean (μ) if 21% of the values are below 50?**



$$z = \frac{x - \mu}{\sigma}$$

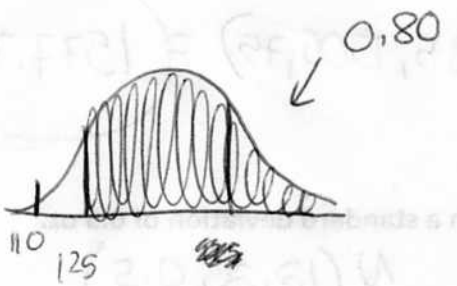
$$z = \frac{50 - \mu}{10}$$

$z = \text{invnorm}(0.21, 0, 1) = -0.806 = \frac{50 - \mu}{10}$

$\mu = 58.06$

$-8.06 = 50 - \mu$

4. **Given a normal distribution with 80% of the values above 125 and 90% of the values above 110, what are the mean and standard deviation?**



$z_{125} = \text{invnorm}(0.2, 0, 1) = -0.84$

$z_{110} = \text{invnorm}(0.1, 0, 1) = -1.282$

$-0.842 = \frac{125 - \mu}{\sigma}$ $\quad -1.282 = \frac{110 - \mu}{\sigma}$

$-0.842\sigma = 125 - \mu$ $\quad -1.282\sigma = 110 - \mu$

$\sigma = \frac{125 - \mu}{-0.842}$ $\quad \sigma = \frac{110 - \mu}{-1.282}$

$\sigma = \frac{125 - 153.705}{-0.842}$

$\sigma = 34.1$

$\frac{125 - \mu}{-0.842} = \frac{110 - \mu}{-1.282}$

$-0.842(110 - \mu) = -1.282(125 - \mu)$

$-92.62 + 0.842\mu = -160.25 + 1.282\mu$

$67.63 = 0.44\mu$

$153.705 = \mu$